Claims

1. An apparatus for pulverizing material and extracting moisture from material, comprising:

an inlet tube;

a venturi coupled to the inlet tube;

an airflow generator to generate an airflow and including an input aperture;

a housing at least partially encompassing the airflow generator and including an outlet in communication with the input aperture,

the airflow generator in communication with the venturi to direct the airflow through the venturi, and toward the input aperture, wherein material introduced into the airflow passes through the venturi and is subject to pulverization and moisture extraction; and

an acoustic emission sensor coupled to the housing to receive a resonant frequency indicative of material passing through the housing.

2. The apparatus of claim 1, further comprising a sensor controller in communication with the acoustic emission sensor to receive the resonant frequency and determine a material flow rate.

3. The apparatus of claim 1, further comprising a central processor in communication with the sensor controller.

4. The apparatus of claim 3, further comprising a valve disposed on the venturi to adjust the air volume and air velocity within the housing and the airflow generator, the

valve in communication with the central processor to enable adjustment of the valve by the central processor.

5. The apparatus of claim 3 further comprising a flow control valve in communication with the inlet tube to control the flow rate of material into the inlet tube, the flow control valve in communication with the central processor to enable adjustment of the flow control valve by the central processor.

6. The apparatus of claim 5, further comprising a sensor to monitor the material flow rate of material to the inlet tube.

7. The apparatus of claim 3, further comprising:

a diverter plate coupled to the interior of the housing proximate to the outlet and having a cutting edge proximate to the airflow generator; and

an actuator device coupled to the diverter plate to position the diverter plate, the actuator device in communication with the central processor.

8. The apparatus of claim 1, wherein the acoustic emission sensor is disposed on a backside of the housing.

9. The apparatus of claim 1, wherein the acoustic emission sensor is disposed on a front side of the housing.

10. The apparatus of claim 1, further comprising a second acoustic emission sensor disposed on the venturi, the second acoustic emission sensor to receive a resonant frequency indicative of material passing through the venturi.

11. The apparatus of claim 1, further comprising a second acoustic emission sensor disposed on the inlet tube, the second acoustic emission sensor to receive a resonant frequency indicative of material passing through the inlet tube.

12. A method for pulverizing material and extracting moisture from material, comprising:

providing an airflow generator in communication with a venturi;

the airflow generator generating an airflow through the venturi and towards the airflow generator;

introducing the material into the airflow;

passing the material through the venturi to extract moisture and pulverize the material; and

receiving acoustic emissions indicative of a material flow rate through the airflow generator.

13. The method of claim 12, further comprising disposing the airflow generator within a housing and wherein receiving acoustic emissions includes disposing an acoustic emission sensor on the housing.

14. The method of claim 12, wherein disposing an acoustic emission sensor includes disposing the acoustic emission sensor on a backside of the housing.

15. The method of claim 12, wherein disposing an acoustic emission sensor includes disposing the acoustic emission sensor on a front side of the housing.

16. The method of claim 12, further comprising the acoustic emission sensor communicating with a sensor controller to determine a material flow rate.

17. The method of claim 16, further comprising:

providing a valve on the diverging portion of the venturi;

the valve communicating with a central processor to adjust the air volume and air velocity within the housing and the airflow generator.

18. The method of claim 16, further comprising:

providing a diverter plate coupled to the interior of the housing and having a cutting edge proximate to the airflow generator;

providing an actuator device coupled to the diverter plate; and

the actuator device communicating with a central processor to position the diverter plate.

19. The method of claim 12, further comprising providing an inlet tube coupled to the venturi and wherein the airflow passes through the inlet tube and towards the venturi.

20. The method of claim 19, further comprising:

a flow control valve controlling the material flow rate into the inlet tube; and

the flow control valve communicating with a central processor to adjust the material flow rate.

21. The method of claim 19, wherein receiving acoustic emissions further includes disposing a second acoustic emission sensor on the inlet tube.

22. The method of claim 12, wherein receiving acoustic emissions further includes disposing a second acoustic emission sensor on the venturi.

23. An apparatus for pulverizing material and extracting moisture from material, comprising:

an inlet tube;

a venturi coupled to the inlet tube;

an airflow generator to generate an airflow and including an input aperture;

an axel coupled to the airflow generator;

a balancer coupled to the axel to compensate for imbalance in the axel during rotation; and

a housing at least partially encompassing the airflow generator and including an outlet in communication with the input aperture,

the airflow generator in communication with the venturi to direct the airflow through the venturi, and toward the input aperture, wherein material introduced into the airflow passes through the venturi and is subject to pulverization and moisture extraction.

24. The apparatus of claim 23, further comprising a balancer controller in communication with the balancer, the balancer controller controlling compensation of imbalance.

25. The apparatus of claim 24, further comprising a vibration sensor in communication with the balancer controller and to receive vibrations from the axel indicative of imbalance.

26. The apparatus of claim 23, wherein the balancer is an external balancer including compensating weights.

27. The apparatus of claim 26, wherein the external balancer includes two compensating weights rotatable around an axis of the external balancer.

28. The apparatus of claim 23, wherein the axle includes an internal bore and the balancer is an internal balancer at least partially disposed within the internal bore and including compensating weights.

29. The apparatus of claim 28, wherein the internal balancer includes two compensating weights rotatable around an axis of the internal balancer.

30. The apparatus of claim 29, wherein the two compensating weights are disposed in an over and under configuration relative to one another.

31. The apparatus of claim 23, wherein the balancer is a ring balancer including compensating weights.

32. The apparatus of claim 31, wherein the ring balancer includes two compensating weights rotatable around an axis of the ring balancer.

33. A method for pulverizing material and extracting moisture from material, comprising:

providing an airflow generator in communication with a venturi;

providing an axel coupled to the airflow generator;

coupling a balancer to the axel;

the balancer compensating for imbalance in the axel during rotation;

the airflow generator generating an airflow through the venturi and towards the airflow generator;

introducing the material into the airflow; and

passing the material through the venturi to extract moisture and pulverize the material.

34. The method of claim 33, wherein the balancer is an external balancer including compensating weights.

35. The method of claim 34, wherein the external balancer includes two compensating weights rotatable around an axis of the external balancer.

36. The method of claim 33, wherein the balancer is an internal balancer including compensating weights and further comprising:

providing an internal bore within the axle; and

at least partially disposing the internal balancer within the internal bore.

37. The method of claim 36, wherein the internal balancer includes two compensating weights rotatable around an axis of the internal balancer.

38. The method of claim 37, further comprising disposing the two compensating weights in an over and under configuration relative to one another.

39. The method of claim 33, wherein the balancer is a ring balancer including compensating weights.

40 The method of claim 39, wherein the ring balancer includes two compensating weights rotatable around and axis of the ring balancer.

41. The method of claim 33, further comprising receiving vibrations indicative of axel imbalance.

42. The method of claim 41, further comprising:

sending signals indicative of axel imbalance to a balancer controller; and

the balancer controller determining an imbalance and controlling compensation to offset the imbalance.

43. The method of claim 33, wherein the balancer includes compensating weights, and further comprising:

disposing the balancer proximate to the airflow generator; and

moving the compensating weights to within an opposing semicircle as that of a point of imbalance in the airflow generator to thereby provide balance compensation.

44. The method of claim 33, wherein the balancer includes compensating weights, and further comprising:

disposing the balancer remote to the airflow generator; and

moving the compensating weights to within the same semicircle as that of a point of imbalance in the airflow generator to thereby provide balance compensation.